Water Quality Assessment of the Lower Youghiogheny River Basin

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Abstract

This paper describes the use of the traditional synoptic survey to evaluate the water quality conditions in the lower Youghiogheny River basin from Connellsville, PA to McKeesport, PA. Field work and data analysis was performed as a joint effort of the U.S. Department of Energy, Federal Energy Technology Center (DOE-FETC) and the U.S. Geological Survey (USGS). Water quality sampling was completed during a low-flow period of October 1998. Historical data on mine drainage from 1970 to the present was also evaluated to better understand the current water quality conditions in this river.

The study concluded that the Youghiogheny River should be considered a fragile system. The river was shown to have low alkalinity concentrations which, because of the shear magnitude of flow, translate into a large alkalinity load. However, the river's full chemical potential for neutralizing any acidity produced by mine drainage can be realized only with complete mixing. But, there is an observable lack of mixing and additional inputs could have more serious impacts than the average chemistry would suggest. Consequently, additional or continued contamination could lead to degradation of selective portions of the river. One example would be along the riverbanks where visible iron plumes, deposited by tributaries, hug the edges of the river for miles as can be seen in Figure 1.

The sulfate ion was used to calculate a material balance and as a tracer in this study because of its relationship with mine drainage. As can be seen in Figure 2, Sewickley Creek was the most significant sulfate contributor in the lower Youghiogheny River Basin; it alone contributed nearly half of the load (44%). Historical data collected under similar flow conditions showed that two sites, Brinkerton Mine site and Wilson Run Mine site, accounted for up to 15% of the total Sewickley Creek load, 10% and 5%, respectively. Some care, however, must be taken in using the sulfate ion as a measure of mine drainage impact because it is present in both treated and untreated mine drainage, and there are a few permitted discharges in the watershed.

This synoptic (or summary) survey was completed by trained, experienced professionals, many of whom were familiar with the river. In addition, local conservation groups and various government agencies were consulted regarding all the potential sources of pollution prior to the survey. Yet, when the material balance was completed, over a quarter of the sulfate load was unaccounted for (Figure 2), indicating that some sources were missed. Segments of the river that overlie mined-out portions of the basin where artesian flow is known to exist were identified as the probable locations of the missing pollution sources. It is likely, based on visual observations of iron staining in the river channel, that a large percentage of this missing pollutant load is generated by artesian flow into the river through fracture systems.

The Youghiogheny River has contributed to an economic revitalization within the region, due to a broad range of recreational activities, and continued growth in this area is expected. At present, due to the extensive historical mining practices throughout this region, it is at perpetual risk of becoming inundated with mine drainage, which would have a detrimental effect on the nascent recreational activities. The unexpected and catastrophic discharge of mine drainage into the Casselman River in 1992 presented such a serious threat to the Youghiogheny River that it was thought that the buffering capability would be incapable of absorbing this pollution. Had not the upstream reservoir been available

and opened quickly by the US Corps of Engineers, the resulting acid would have wiped out all of its aquatic life. Other threats within the river's basin include mine drainage treatment facilities that can fail and depend on the operating company's economic ability to maintain their operation for perpetuity. By addressing and remediating the significant abandoned mine drainage issues within this region, the ability of the Youghiogheny River to handle future environmental disasters, like the Casselman River incident, without dire consequences will be improved. This current load is about at the maximum amount of pollution that the river can handle now.

Figure 1. Sewickley Creek Entering the Youghiogheny River

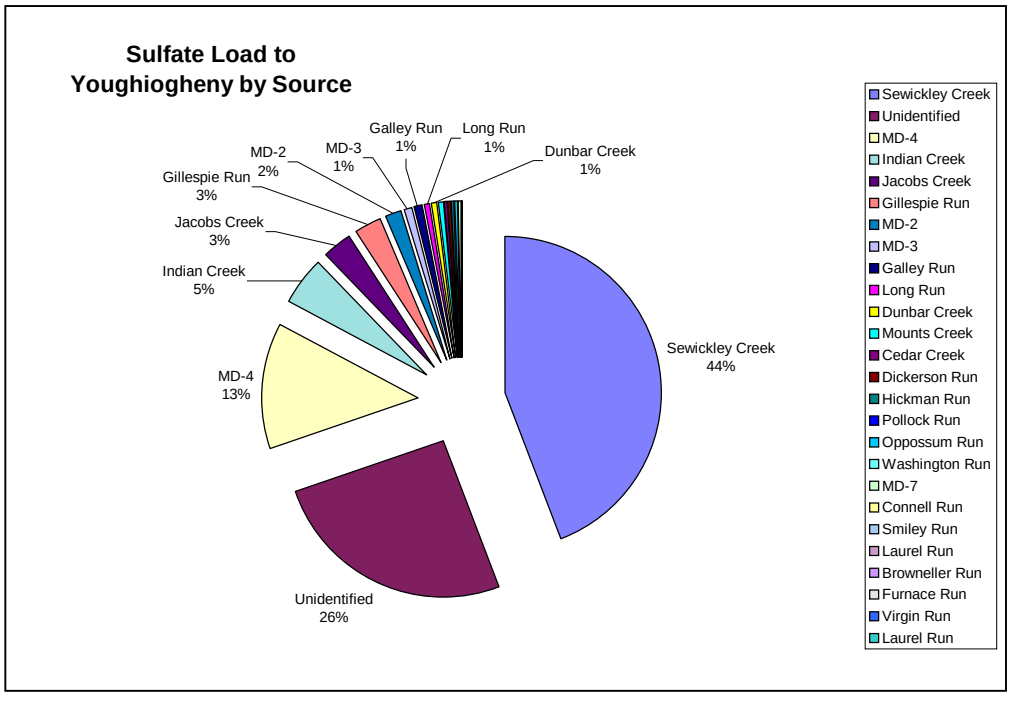

Figure 2. Sources of Sulfate in the Youghiogheny